Amendments to the Specification

*Page 9: Replace the paragraph beginning at line 25 with the following.*

Microchip device 5A as seen in Figure 1A has a bridging membrane 65 (i.e., a thin electrically conductive porous glass layer) between microchannel ~~10b~~ 20B and channel 25. The microchip 5A has two channels in close proximity to each other. The distance between adjacent channels will vary depending on the etch time used to form the channels in the substrate, 0 - 35 μm bridges are typical. In the case of glass for example, the etch is isotropic so the longer the etch the closer the two channels come to physically connecting. Also, a low temperature bonding technique is used in order to generate a thin porous layer between the cover plate 15 and the substrate 10 at the bridging membrane junction 65. For microchip 5A, the preferred channel separation distance between channel ~~10b~~ 20B and channel 25 is about 6 μm. Figure 2 shows a cross-sectional profile of an embodiment of ~~channel 10b~~ channels 20B and 25, cover plate 15, and bridging membrane 65. The depth and width of the channels were determined with a stylus profilometer.

*Page 10: Replace the paragraph beginning at line 20 with the following.*

Referring now to Figure 3A, there is shown a portion of a physical embodiment of a microchannel device such as device 5A. The device shown utilizes a porous glass layer as the bridging membrane. The analysis channel ~~10b~~ 20B and the side channels 5a and 25B have been formed on the substrate 10. Operation of device 5A will now be described with reference to Figures 1 and 3B. A plug 42 of rhodamine B in a sodium tetraborate buffer is first loaded into analysis channel ~~10b~~ 20B using a fixed volume valve arrangement in which electric potentials of 0.6, 0.8, 0, and 0.6 kV are applied to the buffer reservoir 40, the sample reservoir 45, the first waste reservoir 35, and the first side reservoir 55, respectively. (0kV corresponds to ground potential). Electric potentials of 1.0, 0.7, 0.7, and 0 kV are then applied to the buffer reservoir

40, sample reservoir 45, first waste reservoir 35, and first and second side reservoirs 55 and 60, respectively, to provide the electrokinetic driving force for transporting the plug 42 of rhodamine B into the analysis channel 20B. No voltage was applied to second waste reservoir 50, thereby allowing its potential to float. The plug of rhodamine B is transported in the analysis channel 20B by electroosmotic flow between the junction 130 and bridging membrane 65, and by electroosmotic pressure induced in the analysis channel 20B beyond the bridging membrane 65. A small fraction of the rhodamine B from plug 42 moves across the bridging membrane 65 to channel 25, but the bulk of the fluid material flows past the bridging membrane 65 as shown in Figure 3B.

*Page 11: Replace the paragraph beginning at line 22 with the following.*

To measure the velocity with the side channels 25, 25A, and 25B engaged, i.e., with the bridging membrane in operation, electric potentials of 1.0, 0.7, 0.7, and 0 kV were applied to the buffer reservoir 40, sample reservoir 45, first waste reservoir 35, and first side reservoir 55, respectively. No electric potential was applied to the second waste reservoir 50 or the second side reservoir 60. The electroosmotic velocity measured in the vicinity of the bridging membrane was 1.29 mm/s. The profile was again monitored at the bridging membrane junction 65. Graph (b) of Figure 4 shows the timing of the sample as it passes the bridging membrane 65. Graph (c) shows the timing of the same sample as obtained 10 mm downstream from the bridging membrane in a region of the analysis channel ~~10b~~ 20B that is free of an electric field. The velocity of the rhodamine B in the analysis channel 10 mm beyond the junction was measured as 1.09 mm/s. The velocity difference corresponds to an estimated pressure generated in the analysis channel of about 0.10 bar from the use of the bridging membrane.

*Page 13: Replace the paragraph beginning at line 28 with the following.*

Referring now to Figure 8, there is shown a second working example embodied as

microchip 5B in accordance with the present invention. The working example illustrates the use of microchip 5B for concentration enhancement of DNA using a bridging membrane incorporated into the microfluidic network formed on the chip. The microfabricated bridging membrane structure of microchip 5B is similar in design to microchip 5A shown in Figure 1 and described previously herein. Figure 8 is a backlit image of an actual microchip combined with a fluorescence image of the DNA material 208 concentrated in the analysis channel 212 at the bridging membrane 206 (bright spot at the bridging membrane). The concentration enhancement occurs when an electrical potential is applied between the sample channel 200 and the first side channel 202. No electrical potential is applied to the analysis channel 212 in this case, but an electric potential of the same polarity as applied to the sample channel 200, if applied to ~~waste~~ analysis channel 212, would further assist in confining the spatial extent of the concentrated DNA sample 208 adjacent to the bridging membrane 206. The bridging membrane 206 allows small ions to pass but prevents the larger molecules of the DNA 208 from migrating through the bridging membrane 206 in the presence of the electric field. The bridging membrane thus acts as a physical barrier through which the DNA molecules 208 cannot pass and, over time, the DNA 208 accumulates at the bridging membrane junction 206. The amount of DNA 208 collected at the bridging membrane 206 is related to the electric field strength, the time of accumulation, and the electrophoretic mobility of the DNA 208. In this example, the sample channel 200 is grounded, and 1kV is applied to the second side channel 210. The accumulation time is approximately 1 minute. The analysis and side channels, 212 and 202 respectively, are coated with covalently linked linear polyacrylamide to minimize electroosmotic flow and are filled with 3% linear polyacrylamide, a common sieving medium for DNA separations.